

I want to note the passing of Senator FRANK LAUTENBERG.

When I came to the Senate 10 years ago, there were a number of Members here who were veterans of World War II. Now there are none. Senator LAUTENBERG was the last. He was a member of the generation often described as the greatest.

He was the son of immigrants. He made a lot of money in business as an entrepreneur in the American dream. Then he did another entrepreneurial thing: He ran for the U.S. Senate and served twice here. He was an advocate for the things he believed in, and he was a productive Senator. Just in the last couple of weeks he helped to fashion an agreement on amending the Toxic Substances Control Act, of which I am a cosponsor. It has been a long time coming, and he had a major role in that.

We will miss him. To his wife Bonnie and to his family, they have my respect and condolences and admiration for his long service to our country.

CLEAN ENERGY INDEPENDENCE

Mr. ALEXANDER. Mr. President, 5 years ago I spoke at the Oak Ridge National Laboratory. I began with a story from our past about our future. It is a familiar story to those of us in Tennessee.

President Franklin Roosevelt called the chairman of the Senate Appropriations Committee into his office in 1942 and said: Mr. Chairman, I would like to ask you to hide a couple billion dollars in the budget for a secret project to win the war.

Senator McKellar replied: Mr. President. I just have one question: Where in Tennessee would you like me to hide it?

That place turned out to be Oak Ridge. That was how Tennessee became one of the sites where scientists worked to build the atomic bomb before the Germans.

I suggested 5 years ago that we have a new Manhattan Project—really mini-Manhattan Projects for clean energy independence.

Last week at Oak Ridge, 5 years after that first speech, I suggested four grand principles to help us chart a competitive energy future for the next 5 years to end our obsession with taxpayer subsidies and strategies for expensive energy and instead focus on doubling government-sponsored research and allowing marketplace solutions to create an abundance of cheap, clean, reliable energy. I would like to renew those comments today on the floor of the Senate. The four grand principles I mentioned were, No. 1, cheaper, not more expensive, energy; No. 2, clean, not just renewable, energy; No. 3, research and development, not government mandates; and No. 4, the free market, not the government, picking winners and losers.

The seven grand challenges I suggested 5 years ago were grounded in

challenges from the U.S. National Academy of Engineering. My challenges included making plug-in electric vehicles more commonplace, finding ways to capture and use carbon, helping solar become cost-competitive, safely managing nuclear waste, encouraging cellulosic biofuels, making new buildings green buildings, and creating energy from fusion.

My goal in laying out those seven challenges was clean energy independence. At the time, some took issue with the idea of a grand goal underlying these challenges, but I thought independence was a good goal then, and it is a good goal now because the United States should not be held hostage by any other country because of our energy needs.

Since I spoke 5 years ago, the Department of Energy has established the energy innovation hubs that are producing fuels from sunlight and advancing nuclear reactor and battery technologies. That, paired with the work of the new energy research agency—which we call ARPA-E—and others, has moved us forward on my seven grand challenges in a number of ways. Let me summarize that briefly.

Electric vehicles sales are approaching 100,000 in the United States, and ARPA-E has helped a company that has doubled the energy density of lithium-ion batteries.

Carbon capture. We are developing commercial uses for carbon dioxide, such as liquid fuels produced from microbes.

Solar power. Though the goal is around \$1 per watt installed by 2020, the cost has fallen from \$8 to \$4 per watt in the past five years. It still has a long way to go, but it is promising.

Nuclear waste. Four of us in the Senate have drafted comprehensive nuclear waste legislation. For the first time in 30 years, we are building new large reactors, and we are moving forward on small modular nuclear reactors.

Advanced biofuels. There are three new bioenergy research centers that are developing next-generation bioenergy crops for industrial-scale production.

Green buildings. Research and development has meant 20 new commercial products in energy efficiency.

Fusion. We have already demonstrated human-engineered fusion on a small scale, and now we are trying to scale it up for commercial energy production.

The United States has made gains, but we still have challenges. Even as other parts of the world grow rapidly, the U.S. still uses about 20 percent of the world's energy, and the Energy Information Administration estimates that our country's energy demand will increase more than 10 percent by 2040.

Second, we have record oil and gas production at home, but we need to be as independent as possible from those who might want to use our demand for oil to hold us hostage. Former Sec-

retary Condoleezza Rice once said she had "never seen anything warp diplomacy like high oil prices." And affording a tank of gasoline remains a struggle for many families.

Another challenge is failing to keep up with energy research and development, which is one of the major points I want to make today—failing to keep up with energy R&D. That energy research has given us abundant, reliable, clean, cheap energy from unconventional gas to nuclear power. The amount we spend on energy research and development—nearly \$5 billion a year at the Department of Energy in nondefense and noncleanup research; or nearly \$9 billion if you count other agencies and their energy-related research, such as the National Science Foundation, the Department of the Interior, and the National Institute of Standards and Technology—still, those dollars are lower as a percentage of our gross product than major competitors such as France or Japan or Korea or China.

Another challenge is that while the United States has made more gains in reducing the use of carbon than any other industrial country, the National Academies of the United States and 12 other countries have warned that human activity has contributed significantly to climate change and global warming.

So thinking about the progress we have made from 5 years ago and taking into account the challenges we still have, let me suggest four grand principles that could guide our energy future. First, cheaper, not more expensive energy. Five years ago all the talk was about a cap-and-trade program for the United States and deliberately raising the price of energy as a way of achieving clean energy independence.

Last year I was in Germany, a country that adopted exactly that policy. In addition, Germany is closing its nuclear powerplants and becoming more dependent on natural gas but buying both forms of energy from other countries rather than producing it on its own. The Germans are subsidizing wind and solar but are building new coal plants in order to have enough reliable electricity.

In short, what I found in Germany was an energy policy mess that discourages job growth. The end result is that Germany has the second highest household electricity prices in the European Union. When I asked an Economic Minister what he would say to a manufacturer about energy costs in Germany, he said: I would suggest he go somewhere else. Well, that somewhere else is turning out to be the United States: Virginia, Tennessee, other States.

In the United States, we pursued a different track, the most conspicuous example of which is finding unconventional gas and oil. This has created for our country a remarkable phenomenon, a large amount of cheap, clean energy with our own domestic price for natural gas.

This has been the result of a peculiar combination of factors that, in my opinion, amount to a better energy policy than most people give us credit for. The first element is the entrepreneurial spirit of America and the large amount of private property ownership and our huge private market. Another is access to capital. A third and indispensable element is government-sponsored research.

Take our Nation's natural gas boom as an example. In the past it was uneconomical to develop so-called unconventional gas. Government-sponsored research enabled it and demonstrated how it could be done. A temporary Federal tax credit that expired for new shale projects at the end of 1992 encouraged new sources of private capital. Natural gas will be a big part of where we get our clean energy, which leads me to my second principle: clean, not just renewable, energy. Too often we define our energy goals in terms of renewable energy when we should mean clean energy. There are a number of States that have renewable energy mandates defined mainly to include wind and solar power. The Congress is regularly asked to pass a narrowly defined renewable energy mandate for the same purpose.

It is true these energy sources emit no air pollution. These mandates say a certain amount of electricity generated within a State must come from these specific sources. But focusing on this narrow definition for clean energy misses the point, and at a high cost to our electric bills.

Such narrow definitions also discount hydropower and nuclear power, some of our country's cheapest and most available sources of air pollution-free electricity. In the Tennessee Valley Authority region where I live, for example, more than 95 percent of our pollution-free electricity comes from TVA's dams and three nuclear plants, which include six reactors.

Second, mandating renewable energy runs the risk of creating too much reliance on sources that generate power only intermittently. There is certainly a place for these renewable technologies, and solar power especially seems to me to have great promise. But renewable energy consumes great amounts of space, whether it is solar or wind or biomass.

For example, it would take a row of giant wind turbines all the way from Georgia to Maine on the Appalachian Trail to generate the same amount of electricity that we would get from four nuclear power plants. You would still need the nuclear plants because the wind only blows when it wants to.

Fortunately, we have plenty of rooftops on which to put solar panels. When they become cheap enough and aesthetically pleasing enough, they will probably become an increasingly important supplement to our country's huge appetite for electricity, especially because the Sun shines during the peak-use hours.

Battery technology will help make all forms of renewable energy more useful, which brings me to my next principle: research and development, not government mandates. It is hard to think of an important technological advance in our country that has not involved at least some government-sponsored research, especially in the area of energy.

The most recent example is the development of unconventional gas that was enabled by 3D mapping invented at Sandia National Laboratory in New Mexico and the Department of Energy's large-scale demonstration project.

There is an argument that by imposing government mandates, just as by imposing higher prices, government could force some innovation that could move us toward clean energy independence. But I believe the surer path would be to double the federal funding we spend annually on non-defense and non-cleanup energy research and development and trust the marketplace to produce better results.

In 2005 the "Rising Above the Gathering Storm" report, written by a commission led by former Lockheed Martin CEO Norman Augustine, recommended doubling energy research and development. In 2007 Congress responded by passing the America COMPETES Act with overwhelming bipartisan support. Senator COONS and I are working together to reintroduce the America COMPETES Act for a second reauthorization after its original passage.

One small agency that is the result of the America COMPETES Act is what we call ARPA-E. It is already showing signs of the wisdom of this approach. ARPA-E has helped improve battery technology and worked to produce liquid fuel from microbes, among other accomplishments. Seeing how our free enterprise can capitalize on this brings me to my fourth and last principle: free market, not government picking winners and losers.

We are more likely to have abundant supplies of cheap, clean, reliable energy in the United States if we trust the marketplace. The most appropriate role for government is in research. I believe a second role is limited jump-starting of new technologies; for example, unconventional gas, about which I just spoke, involves government research and a limited tax credit.

The full tax credit for electric cars is capped at 200,000 vehicles per manufacturer. To encourage innovation in nuclear energy, the government provided research and licensing support for small modular reactors, but that is limited to 5 years.

Even for nuclear power plants there is a production tax credit, but it is limited to 6,000 megawatts. On the other hand, President Reagan used to say the nearest thing to eternal life we will ever see on this Earth is a government program. That is too often the case with energy subsidies. The most glaring example of that is the more than 20-year-old subsidy for wind power, a

technology that former Energy Secretary Chu said was a technology that had "matured."

This was supposed to help jump-start wind. But we have already lost \$16 billion in Federal revenue from 2009 through the end of 2012 alone. Congress just added a 1-year extension of the wind production tax credit, costing \$12 billion. Remember, the Department of Energy spends just \$5 billion on energy research.

We are spending \$12 billion in a 1-year extension of the wind tax credit. The wind industry's idea of a phaseout would cost tens of billions more. People talk about Big Oil, but the big, unnecessary subsidy is big wind, and a much better place to spend our money would be energy research.

I have been fascinated with the progress we have made on the seven grand challenges I suggested 5 years ago. Perhaps by focusing on these four grand principles, the ones I have suggested in this speech, we can capitalize on the last 5 years of progress and move toward cheap, clean, reliable energy.

Oak Ridge's evolution since the Manhattan Project days provides a good model. About 70 years ago the astonishing collection of physicists that produced the two atomic bombs also enabled nuclear power, nuclear medicine, and other technological advances.

What can we expect 5 years from now? To get a glimpse of the future we might look at what fits within the guiding principles I have suggested today. For example, small modular reactors and virtual reactors that scientists are developing will revolutionize the safety and effectiveness of our nuclear technology.

Game-changing manufacturing is also on the horizon with 3D printing. ARPA-E, a small agency of the Department of Energy that came from America COMPETES, and other groups are increasing the reliability of our electricity supply.

This United States of America is a remarkable place. With the potential I have described and the principles I have suggested, a competitive energy future is well within our grasp.

I yield the floor, and I suggest the absence of a quorum.

The ACTING PRESIDENT pro tempore. The clerk will call the roll.

The legislative clerk proceeded to call the roll.

Mr. MORAN. I ask unanimous consent that the order for the quorum call be rescinded.

The ACTING PRESIDENT pro tempore. Without objection, it is so ordered.

Mr. MORAN. I thank the Chair for the recognition.

THE FARM BILL

Mr. MORAN. I just returned from my home State of Kansas to return to the work we are about to do in the Senate. This week away from Washington, DC,